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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/519,251

12/22/2004

Ho Sung Kim

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WOODARD, EMHARDT, MORIARTY, MCNETT & HENRY LLP  
111 MONUMENT CIRCLE, SUITE 3700  
INDIANAPOLIS, IN 46204-5137

EXAMINER

FEELY, MICHAEL J

ART UNIT

PAPER NUMBER

1712

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/519,251	<b>Applicant(s)</b> KIM ET AL.	
	<b>Examiner</b> Michael J. Feely	<b>Art Unit</b> 1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>20050801</u> . | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

### *Pending Claims*

Claims 1-7 are pending.

### *Priority*

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 presents the following process steps:

- *Adding* expandable hollow micro-spheres to at least one of *the base thermoset components* in the liquid phase; and
- *Applying* heat treatment to *the partially or fully cured thermoset* causing the expandable hollow micro-spheres to expand *during or after curing of the thermoset*.

Firstly, it is not immediately clear what term *the base thermoset components* is referring to.

Secondly, it is unclear if the claim is missing a curing or partial-curing step because it refers to

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*the partially or fully cured thermoset.* Lastly, it is unclear if *the partially cured thermoset* is ever fully cured.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(a/e) as being anticipated by Koshy (US Pat. No. 6,451,876).

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Regarding claims 1, 2, and 6, the prior art discloses: *(1)* a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract; column 2, line 41 through column 3, line 29), and applying heat treatment to the partially or fully cured thermoset (column 11, lines 13-34), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (Abstract); *(2)* wherein the thermoset comprises an epoxy resin (Abstract) and the expandable hollow micro-spheres are added to the epoxy component (Abstract); and *(6)* wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 7, lines 10-24).

6. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Makhlouf et al. (US Pat. No. 5,712,317).

Regarding claims 1, 2, and 6, the prior art discloses: *(1)* a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract), and applying heat treatment to the partially or fully cured thermoset (column 5, lines 11-33), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (column 3, lines 24-45; column 5, lines 11-33); *(2)* wherein the thermoset comprises an epoxy resin (column 2, lines 8-65) and the expandable hollow micro-spheres are added to the epoxy component (Abstract); and *(6)* wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 3, lines 24-45).

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7. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Deviney et al. (US Pat. No. 5,403,655).

Regarding claims 1, 2, and 6, the prior art discloses: *(1)* a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract), and applying heat treatment to the partially or fully cured thermoset (Abstract; Examples), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (column 2, line 61 through column 3, line 62); *(2)* wherein the thermoset comprises an epoxy resin (column 2, lines 30-42) and the expandable hollow micro-spheres are added to the epoxy component (Abstract); and *(6)* wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 2, line 61 through column 3, line 11).

8. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Deviney et al. (US Pat. No. 5,385,778).

Regarding claims 1, 2, and 6, the prior art discloses: *(1)* a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract), and applying heat treatment to the partially or fully cured thermoset (Abstract; Examples), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (column 2, lines 56 through column 3, line 46); *(2)* wherein the thermoset comprises an epoxy resin (column 2, lines 24-36) and the expandable hollow micro-spheres are added to the epoxy component

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(Abstract); and (6) wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 2, lines 56 through column 3, line 6).

9. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Koshy (WO 02/31077).

Regarding claims 1, 2, and 6, the prior art discloses: (1) a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract; pages 3-4), and applying heat treatment to the partially or fully cured thermoset (page 16), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (Abstract; pages 3-4); (2) wherein the thermoset comprises an epoxy resin (Abstract; pages 3-4) and the expandable hollow micro-spheres are added to the epoxy component (Abstract; pages 3-4); and (6) wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (pages 9-10; Examples).

10. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Harrison (US Pat. No. 6,403,222). This is the US equivalent of WO 02/24451.

Regarding claims 1, 2, and 6, the prior art discloses: (1) a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract; column 5, lines 30-52), and applying heat treatment to the partially or fully cured thermoset (Examples), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (Examples; column 5, lines 30-52); (2) wherein the thermoset comprises an epoxy resin (column

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2, line 41 through column 3, line 5) and the expandable hollow micro-spheres are added to the epoxy component (column 5, lines 30-52); and (6) wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 5, lines 30-52).

11. Claims 1, 2, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Makhlouf et al. (US Pat. No. 5,470,886). This is the US equivalent of WO 95/27000.

Regarding claims 1, 2, and 6, the prior art discloses: (1) a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract), and applying heat treatment to the partially or fully cured thermoset (Abstract; column 4, lines 43-45), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (Abstract; column 3, lines 10-21); (2) wherein the thermoset comprises an epoxy resin (column 2, lines 7-64) and the expandable hollow micro-spheres are added to the epoxy component (Abstract); and (6) wherein the expandable hollow micro-spheres consist of a co-polymer shell and gas (column 3, lines 10-21).

12. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Yokohama Rubber (Derwent Abstract 77355W/47).

Regarding claims 1, the prior art discloses: (1) a method of manufacturing a thermoset including the steps of adding expandable hollow micro-spheres to at least one of the base thermoset components in the liquid phase (Abstract), and applying heat treatment to the partially



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or fully cured thermoset (Abstract), causing the expandable hollow expandable hollow micro-spheres to expand during or after curing of the thermoset (Abstract).

***Claim Rejections - 35 USC § 102/103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claim 7 is rejected under 35 U.S.C. 102(a/e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Koshy (US Pat. No. 6,451,876).

15. Claim 7 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over any of: Makhoul et al. (US Pat. No. 5,712,317); Deviney et al. (US Pat. No. 5,403,655); Deviney et al. (US Pat. No. 5,385,778); Koshy (WO 02/31077); Harrison (US Pat. No. 6,403,222); Makhoul et al. (US Pat. No. 5,470,886); and Yokohama Rubber (Derwent Abstract 77355W/47).

Regarding claim 7, all of the prior art references disclose a heating step; however, they fail to explicitly disclose: (7) the creation of compressive residual stress around the expandable hollow micro-spheres. As discussed above, the claims satisfy all of the material and process parameters of instant invention; therefore, it appears that the creation of compressive residual stress would have been an inherent feature of the prior art processes.

Therefore, it appears that the methods of the prior art references inherently provide for the creation of compressive residual stress around the expandable hollow micro-spheres because they satisfy all of the material and process parameters of the instant invention.

***Claim Rejections - 35 USC § 103***

16. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over any of Koshy (US Pat. No. 6,451,876); Makhlouf et al. (US Pat. No. 5,712,317); Deviney et al. (US Pat. No. 5,403,655); Deviney et al. (US Pat. No. 5,385,778); Koshy (WO 02/31077); Harrison (US Pat. No. 6,403,222); and Makhlouf et al. (US Pat. No. 5,470,886).

Regarding claims 3-5, the prior art references disclose the step of: (5) wherein the mixture is stirred after adding the curing agent and poured into a mould for curing (*see rejections above*); however, they fail to explicitly disclose the steps of: (3) wherein the mixture of epoxy component and micro-spheres is heated for easy mixing before adding a curing agent; and (4) wherein the mixture is allowed to cool before adding the curing agent.

With respect to the heating step, one of ordinary skill in the art would have recognized that solids dispersed in liquids tend to increase the overall viscosity of the dispersion as homogeneity of the dispersion is achieved. In addition, one of ordinary skill in the art would have recognized that an increase in temperature allows for the viscosity of the dispersion to decrease. This decrease in viscosity allows for a more fluid mixture, which in turn allows for a more uniform/homogenous dispersion.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to increase the temperature of the dispersion (mixture of micro-spheres and liquid

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thermosetting epoxy) because the temperature increase would have decreased the viscosity of the dispersion, allowing for a more uniform/homogeneous dispersion to be achieved.

With respect the cooling step, one of ordinary skill in the art would have recognized that thermosetting curing reactions are heat-sensitive, wherein the curing reaction proceeds at elevated temperatures. Hence, epoxy thermosetting compositions are stored at normal or below-normal temperatures to prevent premature cross-linking and to ensure shelf-stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to cool the mixture prior to adding the curing agent because this cooling step would have prevented premature cross-linking and ensured shelf-stability of the heat-sensitive epoxy thermosetting composition.


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*Communication*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Michael J. Feely  
Primary Examiner  
Art Unit 1712

June 10, 2007

**MICHAEL FEELY**  
**PRIMARY EXAMINER**